AMENDMENTS TO THE CLAIMS

1-13. (Canceled)

14. (Previously presented) An electrolyte membrane comprising a porous substrate that does not swell substantially with organic solvents or water;

wherein at least a pore of the porous substrate is filled with a graft polymer;

wherein the graft polymer has proton conductivity and is derived from monomers having an ion-exchange group which carries and easily releases a proton, thereby to impart proton conductivity to the electrolyte membrane; and

one end of a molecule of the graft polymer is bound to a surface of the pore.

15. (Previously presented) The electrolyte membrane according to Claim 14, wherein the porous substrate comprises an inorganic material and/or a polymer.

16. (Previously presented) The electrolyte membrane according to Claim 15, wherein the inorganic material is one selected from the group consisting of ceramics and glass.

17. (Previously presented) The electrolyte membrane according to Claim 15, wherein the inorganic material is one selected from the group consisting of glass, alumina, silica, titania and zirconia.

18. (Previously presented) The electrolyte membrane according to Claim 15, wherein the polymer for the porous substrate is polytetrafluoroethylene or polyimide.

19. (Previously presented) The electrolyte membrane according to Claim 14, wherein the porous substrate comprises an inorganic material and/or a heat-resistant polymer.

20. (Previously presented) The electrolyte membrane according to Claim 19, wherein the heat-resistant polymer for the porous substrate is polytetrafluoroethylene or polyimide.

21. (Previously presented) The electrolyte membrane according to Claim 14, which has an ability to prevent methanol permeation.

22. (Previously presented) The electrolyte membrane according to Claim 14, which has an ability to prevent methanol permeation at a temperature of 130°C or higher.

23. (Previously presented) A fuel cell comprising the electrolyte membrane according to Claim 14, wherein the electrolyte membrane is formed on a cathode or on a catalyst layer which is formed on the cathode.

24. (Previously presented) An electrolyte membrane comprising a porous substrate comprising an inorganic material and/or a heat-resistant polymer,

wherein at least a pore of the porous substrate is filled with a graft polymer;

wherein the graft polymer has proton conductivity and is derived from monomers having an ion-exchange group which carries and easily releases a proton, thereby to impart proton conductivity to the electrolyte membrane; and

one end of a molecule of the graft polymer is bound to a surface of the pore.

25. (Previously presented) The electrolyte membrane according to Claim 24, which has an ability to prevent methanol permeation.

26. (Previously presented) The electrolyte membrane according to Claim 24, which has an ability to prevent methanol permeation at a temperature of 130°C or higher.

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1420 Fifth Avenue
Suite 2800
Seattle, Washington 98101
206.682.8100

27. (Previously presented) The electrolyte membrane according to Claim 24, wherein the inorganic material is one selected from the group consisting of ceramics and glass.

28. (Previously presented) The electrolyte membrane according to Claim 24, wherein the inorganic material is one selected from the group consisting of glass, alumina, silica, titania and zirconia.

29. (Previously presented) The electrolyte membrane according to Claim 24, wherein the heat-resistant polymer for the porous substrate is polytetrafluoroethylene or polyimide.

30. (Previously presented) A fuel cell comprising the electrolyte membrane according to Claim 24, wherein the electrolyte membrane is formed on a cathode or on a catalyst layer which is formed on the cathode.

31. (Previously presented) An electrolyte membrane comprising a porous substrate comprising an inorganic material and/or a polymer,

wherein a pore of the porous substrate is filled with a graft polymer;

wherein the graft polymer has proton conductivity and is derived from monomers having an ion-exchange group which carries and easily releases a proton, thereby to impart proton conductivity to the electrolyte membrane; and

one end of a molecule of the graft polymer is bound to a surface of the pore.

32. (Previously presented) The electrolyte membrane according to Claim 31, which has an ability to prevent methanol permeation.

33. (Previously presented) The electrolyte membrane according to Claim 31, which has an ability to prevent methanol permeation at a temperature of 130°C or higher.

34. (Previously presented) The electrolyte membrane according to Claim 31, wherein the inorganic material is one selected from the group consisting of ceramics and glass.

35. (Previously presented) The electrolyte membrane according to Claim 31, wherein the inorganic material is one selected from the group consisting of glass, alumina, silica, titania and zirconia.

36. (Previously presented) The electrolyte membrane according to Claim 31, wherein the polymer for the porous substrate is polytetrafluoroethylene or polyimide.

37. (Previously presented) A fuel cell comprising the electrolyte membrane according to Claim 31, wherein the electrolyte membrane is formed on a cathode or on a catalyst layer which is formed on the cathode.

38. (Previously presented) A method for manufacturing an electrolyte membrane, comprising:

irradiating with energy a porous substrate that does not swell substantially with organic solvents or water;

contacting the substrate with monomers each having an ion-exchange group which carries and easily releases a proton, thereby to impart proton conductivity to the electrolyte membrane; and

allowing the monomers to polymerize in at least one pore wherein one end of the resulting polymer molecule is bound to a surface of the pore.

39-41. (Canceled)

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1420 Fifth Avenue
Suite 2800
Seattle, Washington 98101
206.682.8100

42. (Previously presented) A fuel cell, comprising:

a cathode;

an anode; and

an electrolyte sandwiched therebetween,

wherein the electrolyte comprises a porous substrate and a graft polymer having proton conductivity;

wherein the porous substrate comprises an inorganic material and/or a heat-resistant polymer; and

wherein at least one graft polymer molecule is bound to a surface of a pore in the porous substrate at one end of the graft polymer molecule and the graft polymer fills the pore.

43. (Previously presented) The fuel cell according to Claim 42, wherein the electrolyte has an ability to prevent methanol permeation.

44. (Previously presented) The fuel cell according to Claim 42, wherein the electrolyte has an ability to prevent methanol permeation at a temperature of 130°C or higher.

45. (Previously presented) The fuel cell according to Claim 42, wherein the inorganic material is one selected from the group consisting of ceramics and glass.

46. (Previously presented) The fuel cell according to Claim 42, wherein the inorganic material is one selected from the group consisting of glass, alumina, silica, titania and zirconia.

47. (Previously presented) The fuel cell according to Claim 42, wherein the heat-resistant polymer is polytetrafluoroethylene or polyimide.

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CHRISTENSEN O'CONNOR JOHNSON KINDNESS[PLLC]
1420 Fifth Avenue
Suite 2800
Seattle, Washington 98101
206.682.8100

48. (Previously presented) The fuel cell according to Claim 42, wherein the fuel cell is a direct methanol polymer fuel cell.

49. (Previously presented) A method for manufacturing a fuel cell, comprising:

applying a sol to a first electrode;

forming a porous thin layer from the applied sol;

filling a polymer in pores of the porous thin layer to form an electrolyte membrane on the first electrode; and

attaching a second electrode onto the electrolyte membrane.

50. (Previously presented) The method according to Claim 49, wherein the porous thin layer comprises an inorganic material.

51. (Previously presented) The method according to Claim 50, wherein the inorganic material is one selected from the group consisting of ceramics and glass.

52. (Previously presented) The method according to Claim 50, wherein the inorganic material is one selected from the group consisting of glass, alumina, silica, titania and zirconia.

53. (Previously presented) The method according to Claim 49, wherein the electrolyte membrane has an ability to prevent methanol permeation.

54. (Previously presented) The method according to Claim 49, wherein the electrolyte has an ability to prevent methanol permeation at a temperature of 130°C or higher.

55. (Previously presented) The method according to Claim 49, wherein the step of applying the sol to the first electrode, the first electrode has a first catalyst layer and a first support layer, and the sol is applied to the first catalyst layer.

56. (Previously presented) The method according to Claim 49, wherein the step of attaching the second electrode, the second electrode has a second support layer and a second catalyst layer, and the electrolyte membrane is attached to the second catalyst layer.

57. (Previously presented) The method according to Claim 49, wherein the step of filling the polymer in pores of the porous thin layer to form an electrolyte membrane on the first electrode, monomers having an ion-exchange group are polymerized so that at least one end of a polymer molecule is bound to a surface of a pore, and the polymer fills the pore.

58-65. (Canceled)

66. (Previously presented) An electrolyte membrane, comprising:

a porous substrate that does not swell substantially with organic solvents or water; and

a polymer having proton conductivity;

wherein the polymer fills pores of the porous substrate;

wherein a layer comprising the polymer is placed on a surface of the porous substrate; and

wherein the porous substrate consists essentially of an inorganic material selected from the group consisting of ceramics and glass.

67. (Previously presented) The electrolyte membrane according to Claim 66, which has an ability to prevent methanol permeation.

68. (Previously presented) The electrolyte membrane according to Claim 66, which has an ability to prevent methanol permeation at a temperature of 130°C or higher.

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CHRISTENSEN O'CONNOR JOHNSON KINDNESS[PLLC]
1420 Fifth Avenue
Suite 2800
Seattle, Washington 98101
206.682.8100

69. (Previously presented) The electrolyte membrane according to Claim 66, wherein the inorganic material is one selected from the group consisting of glass, alumina, silica, titania and zirconia.

70. (Previously presented) A fuel cell comprising the electrolyte membrane according to Claim 66.

71. (Previously presented) The fuel cell according to Claim 70, wherein the electrolyte membrane is formed on a cathode or on a catalyst layer which is formed on the cathode.

72-83. (Canceled)

84. (New) An electrolyte membrane, comprising:

a porous substrate, wherein a proton conductive, graft polymer, which has an ion-exchange group which carries and easily releases a proton, thereby to impart proton conductivity to the electrolyte membrane, is chemically bound to a surface of a pore.

85. (New) The electrolyte membrane according to Claim 84, wherein the porous substrate comprises an inorganic material selected from the group consisting of ceramics and glass.

86. (New) The electrolyte membrane according to Claim 84, wherein the porous substrate comprises a polymer selected from the group consisting of polytetrafluoroethylene and polyimide.

87. (New) The electrolyte membrane according to Claim 84, which has an ability to prevent methanol permeation.

88. (New) A fuel cell, comprising:

a cathode;

an anode; and

an electrolyte sandwiched therebetween,

wherein the electrolyte comprises a porous substrate and a graft polymer having proton conductivity;

wherein the porous substrate comprises an inorganic material and/or a polymer; and

wherein at least one graft polymer molecule is bound to a surface of a pore in the porous substrate at one end of the graft polymer molecule and the graft polymer fills the pore.

89. (New) The fuel cell according to Claim 85, wherein the fuel cell is a direct methanol polymer fuel cell.

LAW OFFICES OF
CHRISTENSEN O'CONNOR JOHNSON KINDNESS[PLLC]
1420 Fifth Avenue
Suite 2800
Seattle, Washington 98101
206.682.8100